

Greening Project Status Report: Yellowstone National Park



**Prepared for the
Federal Energy Management Program
U.S. Department of Energy**

February 2001

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The Greening of Yellowstone: Status Report and Accomplishments

1. Introduction

In 1997, Yellowstone National Park celebrated the 125th anniversary of its inception as the nation's first national park. On March 1, 1872, the western United States was still rather sparsely populated, and the government had the foresight to set aside Yellowstone's 2.2 million acres to be "dedicated and set apart as a public park or pleasuring ground for the benefit and enjoyment of the people."



Park entrance

U.S. cavalry were sent to Yellowstone in 1886 to help prevent poaching and damage to the area's many natural features. The cavalry established Fort Yellowstone in Mammoth Hot Springs as its headquarters, in the northwest corner of the park. Soldiers remained there until 1916 when the National Park Service (NPS) was formed and began managing the park. Fort Yellowstone then became the NPS Headquarters, and it is still the Park Service's center of operations.

It was not long before Yellowstone's beauty and magnificence became well known throughout the nation and the world. Fifty million people visited the park during its first 100 years; another 50 million have visited the park in the last 25 years. On the average, 3 million people visit Yellowstone each year, 2 million of them during June, July, and August alone.

2. Context of the Project

As the park approached its 125th anniversary in 1997, NPS began to consider ways to ensure the protection and preservation of Yellowstone for the next 125 years. Park staff began addressing a wide array of issues concerning sustainability, such as pollution prevention, waste management and recycling, and the use of alternative fuels.



Park visitors of yesteryear enjoyed the Hot Springs

Although Yellowstone is a large park, its developed areas are rather small, as are many of the surrounding communities in the greater Yellowstone region. As a result, there are not enough local resources to successfully address all issues associated with sustainability. Partnering with other groups, organizations, and agencies has been one solution to this problem.

3. Design and Decision Process

Partnerships with local and state governments and a number of private interests have played key roles in the success of many projects. In partnership with the states of Montana, Wyoming, and Idaho (which obtain economic benefits from tourism at Yellowstone) as well as with the U.S. Department of Energy (DOE) and some private groups, NPS organized two conferences on sustainability held in October 1996 and May 1998.

The first, The Greening of Yellowstone Workshop, was held “to generate new ideas for sustainability in the park and region, and develop environmentally friendly practices that address human needs while preserving the unique cultural, historic and environmental qualities of (the) country’s first National Park,” according to those who organized the conference. They established six focus groups, one for each of these topics: alternative fuels, building materials and design, cleaner products and better practices, energy and transportation, transportation systems, and waste management. More than simply brainstorming ideas and practices, members of the focus groups were challenged to set goals and define ways to reach those goals.

The second conference, titled The Greening of Yellowstone and Beyond: Preserving and Protecting Our Future, brought together many participants from the first one as well as several new partners. This conference followed up on successes that had taken place over the previous two years and looked at opportunities for partnering and developing new recommendations. Five new focus groups were organized to take another look at each of these topics: transportation, buildings, energy, waste management and recycling, and pollution prevention. Several of the important recommendations and actions from both conferences are listed below and summarized in a table at the end of this report.

4. Highlights of Environmental Strategies and Accomplishments



Congestion occurs occasionally on park roads.

Transportation

Transportation through the park could be one of the greatest sustainability issues Yellowstone is facing. The first permit allowing private automobiles to enter the park was issued in 1915. In 1917, the park officially opened to automobile traffic. Today 80% of all visitors tour the park in nearly 1 million vehicles, and there are five park entrances. This much traffic can cause congestion—such as the “animal jams” that occur when many vehicles stop at once along a two-lane highway to view wildlife—and air pollution.

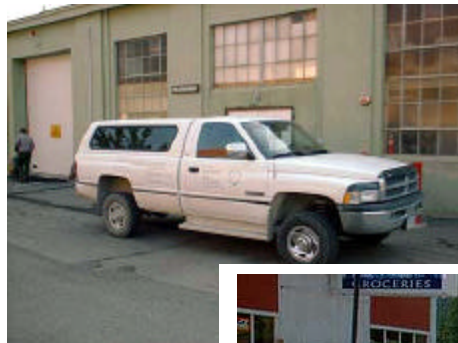
Congestion is a problem in both summer and winter. In winter, automobiles are often replaced by snowmobiles, which produce greater emissions. At certain times, nearly 2,000 snowmobiles per day may enter the park. As a result, Yellowstone staff and their partners have been conducting activities like these:

- The park has partnered with the state of Montana to research bio-based fuels and lubrication oils for vehicles. Surrounding communities, such as West Yellowstone, have voluntarily implemented bio-based lubrication oils in snowmobile rentals based on this research.
- Air quality is being tested at various congestion areas to gather baseline snowmobile emissions data.
- The Environmental Protection Agency (EPA) is drafting guidelines that could be incorporated by 2003, setting noise and emissions standards for snowmobiles.
- At the Society of Automotive Engineers' (SAE) Clean Snowmobile Challenge in March 2000, several universities were challenged to develop a prototype snowmobile "that retains today's performance while reducing pollution and noise." The University of Buffalo in New York developed a 4-stroke engine prototype that reduces typical emissions by 99%.
- In a ride-sharing program now in its third year, employees who live outside the park can be transported on buses obtained through a partnership with DOE's Idaho Engineering and Environmental Laboratory. This program has reduced traffic in the park by about 40 employee vehicles per day.



Biodeisel test vehicle

- The Truck-in-the-Park Program introduced an unmodified 3/4 ton 4x4 diesel pickup truck used by the maintenance department that in Phase 1 logged 121,000 miles running on 100% biodiesel fuel made from rapeseed (canola) ethyl ester. Rapeseed is harvested from Idaho and Montana; the oil is then extracted at the University of Idaho and combined with ethanol made of potato waste from the food processing industry. After 100,000 miles, a teardown of the truck's engine indicated little wear and no carbon buildup. The park has developed a related education program for the public. Phase 2 of this project involves evaluating the truck's engine after the next 100,000 miles of operation.



Buildings

Yellowstone has several historic structures, such as the Old Faithful Inn. Many of these structures present opportunities for greater energy efficiency through advanced technologies as they are maintained, remodeled, or replaced. In fact, all existing and planned park structures are being considered for sustainability improvements. Several activities have already started and some have been completed:



Old Faithful Inn

- An architectural and landscape design standard has been drafted. This document was adapted from the *Yellowstone Design Guidelines* and other national green building standards.
- A Sustainable Design, Building & Development Resource Directory has been developed for Yellowstone; it is available in printed form and on the Internet (see www.greendesign.net). It contains lists of professionals in the field, resources, local initiatives, and educational tools.
- A new visitor center is being planned for the Old Faithful area to have minimal impacts on the environment. The building design could incorporate the LEED Green Building Rating System.
- With assistance from DOE, several maintenance facilities have undergone heating, insulation, and lighting retrofits. Additional retrofits are also being made throughout the park.

In addition, 30,000 square feet of a wooden viewing platform around Old Faithful have been replaced with one made of recycled plastic “lumber,” which contains the equivalent of more than 4 million plastic milk containers.

Energy

The historic structures in the park present many opportunities for improving the energy efficiency of Yellowstone’s facilities. Even before the first greening workshop was held, several remote sites had already been indentified as desirable places to use renewable energy.

On the one hand, the remoteness of most Yellowstone facilities from utility lines makes it expensive to extend service to these structures. On the other hand, some renewable energy systems are also expensive. The fact that much of the park is shut down during winter adds to the economic concerns associated with choosing suitable energy options. After studying several options, the NPS made the following choices for energy use in the park:



Photovoltaic array at Lamar Buffalo Ranch

- A 7-kilowatt photovoltaic (solar electric) array has been installed at Lamar Buffalo Ranch; the array provides roughly 70% of a building's energy needs. Two more off-grid systems are also being pursued. Feasibility studies have been conducted at Lewis Lake and Bechler Meadows, and financing is being sought for new energy systems there.
- Discussions are being held about the use of fuel cells in certain locations, such as the new visitor center. However, the feasibility of using fuel cells that run on propane in Yellowstone depends at least in part on securing and transporting adequate supplies of fuel.

- Energy savings have been realized through heating, insulation, and lighting upgrades in many facilities.
- Concessionaires have begun participating in environmental marketing programs, such as asking visitors to use energy and water more wisely at lodges and hotels (for example, by reducing the frequency of laundry service).

Waste Management and Recycling

A 1994 waste management study indicated that 60%-75% of the waste in Yellowstone could be recyclable or compostable. These estimates suggest that a savings of nearly \$100,000 per year could be realized. "We want to do something better than just haul our garbage a hundred miles and throw it in a hole in the ground," said Tim Hudson, Chief of Maintenance.

To address this issue, the park seeks to meet the government's goal of reducing solid waste by 25% by the year 2002. Issues of remoteness and quantity pose problems for waste management that are similar to the problems associated with energy use, so partnerships have been crucial in finding successful solutions. The following activities are examples:

- Partnering with seven counties and two cities in the Headwaters Recycling Cooperative has made recycling feasible in the park. The amount of recycled waste has more than tripled, to approximately 10,000 cubic yards, since the program began in 1998. Items currently being recycled include newspaper, glass (incorporated into resurfacing projects as 'glassphalt'), aluminum, steel, cardboard, office pack, and magazines.
- A large-scale composting project has undergone feasibility studies and is moving forward; a private-sector composting center will be located in the community of West Yellowstone.
- A mobile recycling center has been located in the Madison Campground.

- A pollution prevention (P2) program has been developed to reduce the amount of hazardous waste in the park and surrounding communities.

Pollution Prevention

Pollution prevention in the park is being accomplished by many of the strategies and accomplishments associated with transportation, buildings, energy, and waste management and recycling listed in this report. The P2 Program incorporates best practices in solid waste management, wastewater management, emissions reduction, and energy and water conservation. These strategies are being pursued:

- Nearly all cleaning products in the park were replaced with environmentally safe cleaning products, which has also saved money.
- Yellowstone has partnered with several nearby cities to pursue DOE's Clean Cities designation. Because of their combined efforts to address the program's requirements, designation could occur in 2001.
- Many West Yellowstone businesses—such as Swan Cleaners, Holiday Inn, Stagecoach Inn, and Sinclair Travel Center—have worked with the Montana P2 Program to identify and implement pollution prevention strategies.
- The Truck-in-the-Park Program has successfully demonstrated that the use of alternative fuels significantly reduces the amount of hydrocarbons, nitrogen oxides, and carbon monoxide vehicle emissions.
- The SAE Clean Snowmobile 2000 Challenge demonstrated that it is possible to redesign or modify snowmobiles to have fewer emissions. The 2001 event will build on those findings.
- The Employee Ride Share Program has been successful in decreasing the use of about 40 employee vehicles per day in the park.
- Many heating systems in Yellowstone's buildings have been converted from fuel oil to more efficient, cleaner-burning propane, and the Lamar Buffalo Ranch now obtains 70% of its energy needs from the sun.
- On several trails and walking paths, a new pine-resin-based alternative to petroleum-based asphalt is being used. The pine resin is also a reclaimed by-product of manufacturing industries and is applied as a "cold emulsion," saving significant additional amounts of energy.



Environmentally safe cleaning supplies

Status of Greening Strategies

Transportation	
<u>Actions</u>	<u>Comments</u>
Conduct accurate research, testing and analysis to understand the impacts of snowmobile emissions. Identify low-cost actions that can be taken to reduce emissions.	<ul style="list-style-type: none"> Partner with the state of Montana to research bio-based fuels and lube oils for snowmobiles. Surrounding communities, such as West Yellowstone, have voluntarily implemented bio-based lubrication oils in their snowmobile rentals. Test air quality at various congestion locations to gather baseline snowmobile emissions data.
Work with snowmobile manufacturers/users to adhere to emissions and noise standards.	EPA is drafting regulations for incorporation by 2003 concerning noise, emission, and energy use guidelines for snowmobiles.
Test fuel cell/electric snowmobiles.	Develop an electric snowmobile for demonstration.
Challenge manufacturers to provide models; invite interested third party to champion cause.	At the SAE Clean Snowmobile 2000 Challenge last year, several universities developed prototype snowmobiles "that retain today's performance while reducing pollution and noise." The University of Buffalo (NY) developed a 4-stroke engine prototype that reduced emissions by 99%. Another event is being held in 2001.
Provide demonstrations that show solutions available from the use of alternative fuels and other strategies to reduce emissions. Initiate National Park Service fleet demonstrations	<ul style="list-style-type: none"> An Employee Ride Share Program is in its third year. Employees living outside the park are transported on buses obtained through partnership with DOE's Idaho Engineering and Environmental Laboratory, removing about 40 cars per day. Truck-in-the-Park Program introduced an unmodified 3/4 ton 4x4 diesel pickup truck used by the maintenance department; it ran successfully for 121,000 miles on 100% biodiesel fuel made from rapeseed (canola) ethyl ester. After 100,000 miles, the engine showed little wear and no carbon buildup. Phase 2 will cover the truck's next 100,000 miles.
Develop a bike corridor.	Biking is allowed in the park, but a corridor has not yet been developed.
Buildings	
<u>Actions</u>	<u>Comments</u>
Create standards to improve building design and construction that would improve air and water quality, energy efficiency, and sustainable material specification.	An architectural and landscape design standard is in draft form, adapted from existing <i>Yellowstone Design Guidelines</i> and other national green building standards.
Develop a regional resource directory to create an infrastructure that will support regional integration of sustainable principles.	A Sustainable Design Regional Resource Directory for Yellowstone has been developed and is available in print and online (www.greendesign.net). It lists professionals in the field, resources, local initiatives, and educational tools.
Redesign centers with sustainable materials and programs. Provide a replicable case study to highlight potential of "greening."	A new, environmentally sound visitor center is planned for the Old Faithful area. The building design will make use of the LEED Green Building Rating System.

Put principles of sustainable design into practice in existing Yellowstone Park buildings.	Several maintenance facilities have undergone heating, insulation, and lighting retrofits, made possible with DOE's assistance. Other efficiency retrofits are ongoing.
Use alternative building products with long life spans in Yellowstone National Park.	The 30,000-sf wooden viewing platform at Old Faithful geyser was replaced with recycled plastic lumber.
Set waste reduction goals for construction projects.	This will be documented in a Yellowstone design standard and is addressed in LEED.
Perform design charrettes.	The second greening workshop, held in 1998, addressed buildings issues and was similar to a charrette.
Energy	
<u>Actions</u>	<u>Comments</u>
Assess individual park facilities and identify energy improvement opportunities.	<ul style="list-style-type: none"> Facilities in Yellowstone are being assessed and documented. Energy savings have been realized through heating, insulation, and lighting upgrades in many facilities.
Replace remote generators with renewable alternatives. Explore opportunities to maximize the potential of green power resources (especially solar).	<ul style="list-style-type: none"> Lamar Buffalo Ranch has a 7-kW photovoltaic array, which provides about 70% of the building's energy needs. Two additional off-grid systems are being investigated for Lewis Lake and Bechler Meadows. Discussions are taking place about the use of fuel cells.
Assess existing hotel/facilities and challenge them to use energy-efficient, environmentally friendly practices (e.g., Holiday Inn's less frequent washing of towels and linens).	Concessionaires have begun participating in environmental marketing programs such as requesting that visitors help to save energy and water at lodges and hotels, e.g., with less frequent laundry service.
Make all new park housing energy efficient.	Ongoing; new staff housing that incorporates efficient features such as lighting, insulation, and HVAC systems is being constructed.
Waste Management and Recycling	
<u>Actions</u>	<u>Comments</u>
Initiate a waste characterization and generation study of the park and gateway communities for developing cost-effective recycling measures.	<ul style="list-style-type: none"> Partnering with seven counties and two cities through the Headwaters Recycling Cooperative makes recycling feasible. The amount of recycled waste has more than tripled since the program began in 1998. Recycled items include newspaper, glass (incorporated into resurfacing projects), aluminum, steel, cardboard, office pack, and magazines. A large-scale composting project is moving forward. A private-sector composting center will be located in West Yellowstone.
Create a Greater Yellowstone Area Waste Management Council to enhance the mission of Yellowstone National Park and the economic and environmental sustainability of greater Yellowstone communities.	This is being achieved through the Headwaters Recycling Cooperative and other projects.

Pollution Prevention	
<u>Actions</u>	<u>Comments</u>
Research opportunities in the park for greater pollution prevention.	<ul style="list-style-type: none"> • Cleaning products in the park were replaced with cost-effective, environmentally safe alternatives. • Several trails and walking paths now contain a pine-resin-based alternative to petroleum-based asphalt. The pine resin is a reclaimed manufacturing by-product applied as a “cold emulsion,” saving significant amounts of energy. • The Truck-in-the-Park Program has successfully demonstrated the use of alternative fuels that significantly reduce hydrocarbons, nitrogen oxides, and carbon monoxide emissions. • The SAE Clean Snowmobile 2000 Challenge demonstrated snowmobile modifications for cleaner emissions. The 2001 event will build on this research. • The Employee Ride Share Program has been successful in decreasing the use of about 40 employee vehicles per day. • Many of the heating systems in Yellowstone buildings have been converted from fuel oil to more efficient, cleaner-burning propane. The Lamar Buffalo Ranch receives 70% of its energy from the sun.
Establish a clearinghouse for sharing information about environmentally safe products.	An information clearinghouse of substitutes/alternatives has been established with the Montana State University Extension Service and is available on the Internet.
Organize a community environmental fair and hazardous waste collection day. The fair would also research businesses willing to receive “environmental reviews” to determine opportunities.	The fair did not take place, but hospitality, food service and small engine repair businesses met with P2 representatives from MSU and the Montana Department of Environmental Quality to discuss environmental issues.
Develop a portfolio of environmental projects.	Completed; MT P2 Program maintains a database.
Continue the P2 Program by partnering with the greater Yellowstone area to develop additional initiatives.	Yellowstone has partnered with several nearby cities to pursue DOE’s Clean Cities designation. Through combined efforts to address the program’s requirements, designation is possible in 2001.

Prepared for the
U.S. Department of Energy
Federal Energy Management Program
And the National Renewable Energy Laboratory
A DOE national laboratory
By ENSAR Group, Inc.
Under NREL Subcontract No. AAR-0-29469-01
August 2000

NREL/EL-710-29847
August 2000